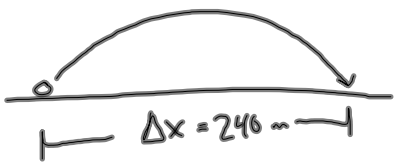
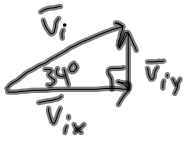
Projectile Motion Practice Problem 5 Solution

5. A golf ball with an initial angle of 34º lands exactly 240 m down the range on a level course.
a. Neglecting air resistance, what initial speed would achieve this result? [50 m/s]
b. Using the speed determined in item a, find the maximum height reached by the ball. [40 m]





a) trying to find v_i, but need to find v_{ix} and v_{iy} first. For full flight, $\Delta y = 0$ m.

$$\tan(34^\circ) = \frac{v_{iy}}{v_{ix}} \qquad v_{iy} = v_{ix}\tan(34^\circ)$$

$$\Delta x = v_{ix}t \qquad \Delta y = v_{iy}t + \frac{1}{2}a_g t^2$$

$$0 = (v_{ix}\tan(34^\circ))t + \frac{1}{2}a_g t^2$$

$$\left[v_{ix}\tan(34^\circ)\right]t = -\frac{1}{2}a_g t^2$$

$$t = -\frac{2v_{ix}\tan(34^\circ)}{a_g}$$

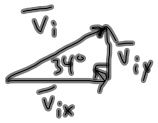
$$\Delta x = v_{ix}\left[-\frac{2v_{ix}\tan(34^\circ)}{a_g}\right]$$

$$\Delta x = \frac{-2v_{ix}^2\tan(34^\circ)}{a_g}$$

$$v_{ix} = \sqrt{\frac{a_g \Delta x}{-2\tan(34^\circ)}}$$

$$= \sqrt{\frac{(-9.8\ m/s^2)(240\ m)}{-2\tan(34^\circ)}}$$

$$= 41.76\ m/s$$



$$v_i = \frac{v_{ix}}{\cos(34^\circ)}$$

$$= 50.4\ m/s$$

b) $v_{iy} = v_i \sin(34^\circ) = 28.2\ m/s$

$$v_{fy}^2 = v_{iy}^2 + 2a_g\Delta y \qquad v_{fy} = 0\ m/s \text{ at top}$$

$$\Delta y = \frac{-v_{iy}^2}{2a_g} = 40.5\ m$$